NON-COGNITIVE MICROFOUNDATIONS: UNDERSTANDING DYNAMIC CAPABILITIES AS IDIOSYNCRATICALLY REFINED SENSISTIVITIES AND PREDISPOSITIONS

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Abstract

The dynamic capabilities framework has been used to explain how firms successfully adapt to changing environments. However, tensions exist in the literature surrounding the idiosyncratic, tacit and hence inimitable nature of dynamic capabilities. The literature struggles to explain in cognitivist terms how such firm capabilities are acquired in the first instance. In this paper, we argue that a firm's dynamic capabilities rest upon a tacitly-shared substrate of sensitivities and predispositions that precede cognitive representation. These sensitivities and predispositions are typically transmitted and shared unconsciously through social practices rather than through formal instruction. They provide the microfoundational substrate of capabilities that enable a firm to effectively respond by orienting its members towards external environmental challenges in a manner unique to the firm's history. Such sensitivities and predispositions provide an organizational *modus operandi* for members to reconfigure capabilities and resources and to capitalize on the opportunities arising therefrom.

Keywords: microfoundations, affordances, habitus, empirical sensitivity, skilled adaptive action, entrepreneurial fitness, adaptive advantage

How firms achieve and sustain competitive advantage over their rivals has been THE perennial question posed within the strategic management literature (Barney, 1991; Ghemawat, 1986; Hansen & Wernerfelt, 1989; Lippman & Rumelt, 1982; Peteraf, 1993; Porter, 1985). According to the resource-based view (RBV) of the firm, it is firm-specific factors such as unique assets, resources and capabilities (Barney, 1991; Peteraf, 1993; Wernerfelt, 1984) that help explain why some firms perform better than others. A superior performing firm is one that is able to achieve competitive advantage over its rivals because its internal resources and capabilities are deemed to be (V)aluable, (R)are, (I)nimitable and (N)on-substitutable (VRIN) (Barney, 1991 : 106-112). RBV assumes that resources and capabilities are *heterogeneously* distributed across competing firms and this crucially explains their differences in performance. Yet, how/why heterogeneity exists amongst firms in the first place and why a superior firm's capabilities are idiosyncratic and hence inimitable and non-replicable remains unclear in the RBV literature.

Arguably, one of the most promising theoretical developments in addressing these questions is the concept of dynamic capabilities (DC). According to Teece (2014: 328) the "dynamic capabilities framework was created…to help scholars and practitioners understand the foundations of firm-level competitive advantage." A DC framework extends RBV by emphasizing how a successful firm is uniquely able to "integrate, build, and reconfigure internal and external competences to address rapidly changing environments" (Teece, Pisano, & Shuen, 1997: 516) (TPS from here on). According to TPS, this firm-specific ability derives from its complex, tacit, historically-shaped and hence idiosyncratic set of routines and competencies.

Since TPS's important contribution, there have been several attempts, some complementary, other contradictory, at extending and clarifying the notion of DC. But questions remain. What accounts for the capacity to 'integrate, build, and reconfigure'? Are a

firm's DC truly idiosyncratic and inimitable and if so why? And finally, are they consciously acquired or do they arise inadvertently and iteratively; if so, how? Without answering these questions, proponents of DC will continue to make contradictory claims as observed by some commentators. Peteraf et al. (2013), in their assessment of the progress DC has made, described the polarization and contradictory tensions in the literature as the "elephant in the room." They show that the two seminal contributions to DC, TPS and Eisenhardt and Martin (2000) (EM from here on), "represent two mutually exclusive approaches for framing dynamic capabilities, each with its own internally consistent logic" (Peteraf et al., 2013: 1389). Peteraf et al.'s observation suggests that much more integrative work need to be done if the concept of DC is to offer greater conceptual mileage in explaining firm success. We build on Peteraf et al.'s observation by identifying and focusing on three key interrelated issues underpinning DC: a) the significance of idiosyncratic differences among firms; b) the non-cognitive/tacit nature of DC; and c) whether DC are inimitable and non-replicable.

Firstly, while both TPS and EM, agree that idiosyncratic differences exist amongst firms, they disagree on its significance. For TPS (1997: 524) idiosyncratic differences enable a firm to "generate rent" through its unique configuration of competencies, routines and skills derived from its particular history. DC emerges from deep, "enterprise-specific roots" so that they "are not so easily imitated by other firms that did not and cannot share this history and…corporate culture." (Teece, 2014 : 333). For EM (2000: 1108), on the other hand, despite idiosyncratic differences, commonalities exist across competing firms because ultimately there are "more and less effective ways to execute" planned actions such as "alliancing, strategic decision making, and knowledge brokering." As such, "dynamic capabilities are more homogeneous and substitutable across firms than traditional RBV thinking assumes." (EM: 1106). While TPS see a firm's DC as idiosyncratic, EM believe that DC, although "idiosyncratic…exhibit commonalities or 'best practice' across firms" (EM: 1118).

Secondly, TPS note that a firm's capabilities are often "so complex that the firm itself, let alone its competitors, does not understand them" (TPS: 525); they are often tacit in nature, do not lend themselves to codification and so cannot be easily "cloned." On the other hand, EM (2000: 1113) state that in "high velocity markets" DC are "simple (not complicated), experiential (not analytic), and iterative (not linear) processes." They acknowledge that "experts frequently fine-tune their cognitive understanding ... and as expertise increases, guidelines become few, strategic, and abstract" (Bingham & Eisenhardt, 2011: 1458). Thus, on the one hand, while EM associate DC with "best practices" (which are replicable), on the other they insist that under "high velocity market" conditions DC take on a different character; one that is more tacit and requires "fine-tuning."

Finally, TPS (1997: 516) insist that the ability to "integrate, build and reconfigure" are what underpins a firm's sustainable competitive advantage. This capacity is further identified as comprising the ability to "sense," "seize" and "transform" (Teece, 2012: 1396) opportunities presented. Such "orchestration" capabilities are what "undergird an enterprise's capacity to successfully innovate and ….to deliver superior long term financial performance" (Teece, 2007: 1320). EM, on the other hand, question DC's ability to deliver sustainable competitive advantage. This is partly because they associate Teecian DC with notions of "routines," "competencies" and "best practices" that are, by definition, more "homogeneous" and "substitutable." Yet, what underpins this beguiling capacity for "sensing," "seizing," "transforming" and "reconfiguring" remains unexplored.

What we can conclude is that despite the underlying tensions between these two accounts, it appears that both are straining to articulate a tacit, non-analytic, experientially-based way of explaining effective adaptive action accruing from situation-specific encounters with changing environments. This is the microfoundational aspect that remains undertheorized and it is this aspect that we develop here.

In this paper we show that a firm's DC originate from a non-cognitive substrate of generic capabilities acquired through extended close-quarter engagement with its extant environment. A finely-honed sensitivity to changing environmental conditions and the corresponding development of a set of generic coping skills is what underpins DC. We maintain that the tensions identified in the DC literature are a consequence of an essentially cognitivist understanding of firm capabilities. By 'cognitive' we mean the understanding of capabilities as resulting from a learning process involving the deliberate acquisition and manipulation of mental representations and that this is what ultimately drives human action.

Cognitivist accounts of capabilities and action typically assume that intelligent action is always motivated by prior thought. It takes the "strong view that…perception, understanding, learning and action are all to be understood on the model of fact gathering, hypothesis information, inference making and problem solving" (Dreyfus, 1988: 100). The insistence that intelligent action can only follow from the capacity for symbol manipulation and abstract, inferential reasoning are therefore fundamental aspects of cognitivism. But there are many practical circumstances where people "act before they think" (March, 1972: 423). Intelligent behavior, learning, and skillful action can be explained "without recourse to mind or brain representations" (Dreyfus, 2002: 367). For Dreyfus, it is "the ability to make more subtle and refined discriminations" and not the ability to calculate and analyze that "distinguishes the expert from the proficient performer" (Dreyfus, 2002: 372). Superior capabilities are ultimately based, not on competencies or best practices, both of which are cognitively representable, but on a non-cognitive substrate.

A non-cognitivist understanding of DC entails conceptualizing it in microfoundational terms as a tacitly-honed capacity for improvisatory adaptive action that is unconsciously acquired in situ through extensive immersion in changing environmental conditions. This, rather than explicitly transmitted cognitively-based rules, routines, best practices or even

heuristics provide the foundational basis for DC. There are two aspects to this skilled adaptive capability: a) a tacitly-transmitted *empirical sensitivity* to the affordances of a firm's environment; and b) a historically-sedimented set of predispositions or *modus operandi* nurtured and shaped by a firm's *habitus*. By empirical sensitivity, we mean a finely-honed attunement to environmental solicitations and the discernment of affordances. By affordances we mean the multiple possibilities proffered by an environment to an active participant immersed in it. And by habitus we mean an internal responsiveness nurtured through the collective complex history of a firm; its tacitly-acquired/transmitted outlooks, social predispositions and internalized practices.

We maintain that DC ultimately derive from this non-cognitive *substrate* that is unavoidably idiosyncratic. We make a case for attending to the seemingly inconspicuous everyday adaptive actions taken at the coal-face of business as the formative substrate of DC. Such idiosyncratic responses gradually aggregate and are internalized into a firm's predispositions that then provide the inimitable and non-substitutable core of firm capabilities. We argue that the Teecian capacity to "sense, seize and transform" and to "integrate, build and reconfigure" ultimately rest on these finely-honed sensitivities. They are essentially idiosyncratic and non-cognitive in character and they enable firm members to act creatively and adaptively in situ. It is important to emphasize here that our focus on non-cognitive capabilities by no means imply that ALL of a firm's strategic activities are so constituted. However, we argue that conscious strategic thought, systematic (analytic) planning and deliberate actions and even Weick's (1995) "sensemaking" which emphasizes the framing of experienced situations in meaningfully symbolic terms, are ultimately grounded on this substrate of non-cognitively acquired sensitivities.

To develop our case for understanding DC in microfoundational terms, we draw on ecologically-based understandings of the nature of non-cognitive intelligence, learning and

adaptive action (Bateson, 1972; Dreyfus, 2014; Gibson, 2015; Ingold, 2000; Merleau-Ponty, 2012; von Uexküll, 2010) to help us better appreciate the firm/environment nexus and interaction. These alternative views of intelligent, adaptive action enable us to explain the idiosyncratic emergence of firm capabilities over time. From this ecologically-based perspective, firm capabilities are "stored," and "shared" not as abstract mental programs, rules or heuristics, but through the firm's sensitivities which reflect its unique collective history and experiences. They serve as an operative substrate that enable firm actors to detect and "orchestrate" or "resource configure" environmental opportunities for value-creation and help explain the kind of "entrepreneurial action," that Teece (2012) more latterly associates with DC.

Our main contribution to the strategy literature, therefore, is a non-cognitive, microfoundational framework that explains how a firm's DC originates from the aggregation of numerous local adaptive actions taken through close-quarter engagements with its operating environment. We make three main contributions to the literature on DC. Firstly, we show how firm-specific capabilities originate from the aggregation of everyday adaptive actions and how that gradually becomes the source of a firm's DC. Secondly, we address the question of the simple/complex and tacit/explicit nature of DC by showing how it is non-cognitively developed. This allows us to theorize the tacit in EM's (2000) "experiential" and "iterative." Thirdly, our framework shows how DC emerges from situation-specific circumstances and how that explains heterogeneity amongst competing firms. We show how DC is reposed on enduring shared sensitivities and nurtured predispositions forged through close-quarter encounters between a firm and its evolving environment. We maintain that this non-cognitive understanding of the origins of DC will help overcome the underlying tensions and contradictions in the DC literature.

The paper is organized as follows. Firstly, we provide an overview of the debate surrounding DC. We demonstrate that the debate turns on the issue of how idiosyncrasies arise/exist, whether they are deliberately achieved or otherwise, and whether they satisfy the VRIN conditions of inimitability and non-substitutability. Secondly, we introduce our ecological approach to understanding immersed adaptive action and develop a non-cognitive microfoundational framework for explaining the origins of DC. We show that a firm's DC is underpinned by two fundamental elements: a) a finely-honed and tacitly-transmitted empirical sensitivity to environmental affordances; and b) a sedimented set of predispositions and modus operandi nurtured, shaped and transmitted through a firm's habitus. Thirdly, we discuss the implications of our framework. We situate our non-cognitive framework within the broader DC literature by drawing important distinctions between detached, deliberate and non-deliberate forms of action and by showing that it is the latter that provides the microfoundational substrate of a firm's DC. Fourthly, we discuss the mechanisms and outcomes arising from these non-cognitive microfoundations. We theoretically elaborate on the mechanisms that lead to superior outcomes. Finally, we identify research questions for the future and specify boundary conditions for our framework.

THREE FUNDAMENTAL CHALLENGES FACING DYNAMIC CAPABILITIES LITERATURE

Teece's many attempts over nearly two decades to define and elaborate on what he and his colleagues originally meant by DC (Teece & Pisano, 1994; Teece, 2012, 2014; Teece et al., 1997) are by no means unproblematic or uncontroversial (Eisenhardt & Martin, 2000; Peteraf et al., 2013). But it is arguably EM's (2000) attempted reformulation of DC that has proven to be the most challenging to the initial Teecian formulation and the latter's subsequent attempts to elaborate and expand on it; it raises into stark relief the internal unresolved tensions inherent in the notion itself (Di Stefano, Peteraf, & Verona, 2010; Di Stefano, Peteraf, & Verona, 2014;

Peteraf et al., 2013). We identify three key interrelated tensions and elaborate on the challenges they pose.

Origins and Significance of Idiosyncrasies

The first major challenge facing DC scholars is establishing the reason for firm-level heterogeneity; why do firms competing in the same environment have different capabilities? Both TPS and EM take the resource-based view as their point of departure. A fundamental premise of the resource-based view is the existence and prevalence of firm-level heterogeneity (Amit & Schoemaker, 1993; Penrose, 2009; Wernerfelt, 1984). This heterogeneity becomes an important consideration when coupled with Barney's (1991) insistence that a firm's sustainable competitive advantage derives from VRIN capabilities. As TPS (1997: 513) state, "competitive advantage … rests on the firm's idiosyncratic and difficult-to-imitate resources." Similarly, EM (2000: 1105) start their paper by acknowledging that "resources are heterogeneously distributed across firms, and that resource differences persist over time." But, neither set of authors attempt to explore the origins of heterogeneity among firms.

Both TPS (1997: 525) and EM (2000: 1112) recognize that local context and situation-specific knowledge has an important effect on performance. Empirical evidence supports this. For example, Salvato's detailed study of new product development at Alessi shows that "micro, ordinary activities carried out by individuals…at all levels in the organizational hierarchy are central to determining the idiosyncratic content of capabilities and their dynamic adaptation over time" (Salvato, 2009: 397). In other words, firm heterogeneity is not simply dependent on the top executive's "mental processes" but on a firm's collectively-shared, historically-shaped practices and predispositions; effective practices that percolate through an entire firm making its outlook and approach unique and idiosyncratic.

Accepting TPS's and EM's insistence that contextual circumstances are underestimated in current theorizing, we must now examine further how a firm, its members and its context

interact in generating heterogeneity. Instead of focusing on individuals, firms and their environment separately we propose a framework that theorizes how experientially-based, interactions between individuals, firms and their environment, iteratively give rise to the emergence of a collective firm character that is unique and idiosyncratic. This explains heterogeneity among firms.

Are Dynamic Capabilities Explicitly or Tacitly Acquired?

The second major challenge facing scholars is establishing whether DC are explicitly and cognitively acquired or whether they emerge tacitly. According to EM (2000 : 1106-1107, our emphasis) DC are "organizational and strategic *routines* by which firms achieve new resource configurations." They range from "complicated, detailed, analytic processes that rely extensively on existing knowledge" (EM: 1106) to "fragile," "unstable," "simple, experiential routines" (EM: 1115). This suggests a spectrum of capabilities ranging from the explicit, cognitively-acquired routines to simple routines. Our argument is that, we can expand the spectrum of capabilities beyond simple rules to include finely-honed and tacitly-acquired "sensitivities" and "predispositions."

Similarly, TPS (1997: 520) initially posited a central role for explicit routines in DC but in response to EM's critique, Teece subsequently insists that "creative managerial and entrepreneurial acts (e.g., creating new markets) are, by their nature, often *non-routine*" (Teece, 2014: 338). They are "never based entirely on routines or rules" (Teece, Peteraf, & Leih, 2016: 18). But what kinds of acts are "non-routine" and not entirely based on "routines or rules"? Are these also what Teece (2007) calls "sensing," "seizing" and "transforming"? What is clear is that both Eisenhardt, Teece and their collaborators are straining to articulate a capacity for spontaneous and ongoing, local adaptive actions.

The tensions surrounding the simple/complex, explicit/or tacit nature of DC in both EM and TPS/Teece's accounts leads us to the question of cognition and mental representation. We

maintain that the reason why EM insists that in high velocity markets, DC are simple, experiential and iterative rather than complicated, detailed and analytical is because, under such urgent and challenging circumstances, managers find it impossible to express cognitively their tacit understanding. EM (2000) note, "the CEO of a major biotech [high velocity market] firm told one of the authors, 'We have the best research process in the industry, but we don't know why'" (2000: 1113). EM interprets this to mean that DC are "fragile" and "unstable" (EM: 1117) and hence better conceptualized as "simple, experiential rules" or "rational heuristics" (Bingham & Eisenhardt, 2011). The attempt to move from "fragile' and "unstable" to "simple, experiential rules" and then to "rational heuristics" to describe DC suggests that Eisenhardt and her associates are struggling to express what is tacit in explicit terms; i.e., from the non-cognitive to the cognitive.

Teece, too, grapples with the explicit/tacit issue of DC. On the one hand, he and his associates maintain; "the manager/entrepreneur must articulate goals, help evaluate opportunities, set culture, build trust, and play a critical role in the key strategic decisions" (Augier & Teece, 2009: 417). This clearly emphasizes explicit expression based on cognitivist premises. Yet, on the other, he also recognizes that DC go beyond such deliberate, planned actions to include "something else" that is "non-routine." For Teece, Apple's "product development is several parts routine but at least one part 'something else' … The something else is non-routine strategizing and entrepreneurial activity, some of which might appear rather ad hoc" (Teece, 2012: 1399).

The key issue here is, what does it mean to say that DC are "non-routine," and "something else" (Teece, 2012: 1399) or that it is "simple, experiential routines" (EM: 1115)? We maintain that the challenge facing EM and Teece and his colleagues, is how to theorize this "non-routine," "something else" that is "simple," "experiential" and "iterative" without relying on a cognitivist theory of action. How do they non-cognitively explain spontaneous, ad hoc human

actions without using terms such as “routines,” “rules,” “procedures,” “competencies” or even “heuristics”? What Teece/TPS and EM need is a non-cognitive microfoundational framework that allows them to theorize DC as the capacity for effective adaptive action in situ without presupposing the need for abstract mental representation.

Inimitability

A third challenge facing DC scholars is the question of the inimitability or otherwise of firm idiosyncrasies. For EM (2000 : 1105-1106), because DC are essentially “best practices” they “have greater equifinality, homogeneity, and substitutability” than generally assumed. This is so even if they are “idiosyncratic in their detail and path-dependent in their emergence” because “just like there are better and worse ways of hitting a golf ball” (EM: 1108) there are better and worse ways of reconfiguring resources and so independent convergence towards “best practice” among firms is always likely. In contrast, for TPS (1997: 525), “competences and capabilities, and the routines upon which they rest, are normally rather difficult to replicate.” In other words, “a well understood and replicable best practice is not likely to constitute a dynamic capability” (Teece, 2007: 1321). So, while Teece believes DC to be inimitable, EM think otherwise.

By emphasizing “equifinality,” “homogeneity” and “substitutability,” EM, in effect, put a dampener on the Teecian insistence on the idiosyncratic nature of a successful firm’s DC. This tension has led Teece to reformulate the notion in order to go *beyond* the concepts of routines, competencies and best practices. While TPS initially equate DC to routines and best practices, they also suggest that ultimately “replication of best practice may be illusive” (TPS: 517). But if DC are indeed idiosyncratic and non-replicable, then they cannot be just substitutable routines or best practices. Teece later recognizes this problem and reasserts in a subsequent article that “the dynamic capabilities framework was never meant to preclude non-routine action” (Teece, 2014: 339).

But why is replication illusive for Teece? TPS draw on Szulanski's (1996) notion of "stickiness" to argue for the non-transferability and replication of a firm's DC. But what makes DC "sticky" in the first place? Teece, (2014) alludes to the importance of corporate histories and heritage. He draws on Gratton and Ghoshal's (2005), notion of "signature processes" to maintain that DC "arise from a company's heritage, including its prior management actions, certain irreversible investments, and context-specific learning" (Teece, 2014: 333). But a key question still remains – how are corporate histories and signature processes linked to current actions? How can we theoretically explain the "carrying forward" of successful past experiences into present actions? We need an explanation of how collectively-shared firm sensitivities emerge AND how it develops a collectively-shaped predisposition that materializes a firm's history into current action.

To summarize, three key interrelated challenges face DC scholars (see Table 1). We label these as challenges of: 1) idiosyncrasies; 2) tacitness; and 3) inimitability. These challenges have their roots in the tensions in the two seminal articles by TPS and EM, but extend beyond them and pose theoretical challenges for the field. Important questions remain unanswered and under-theorized. Questions like: 'How does the individual-firm-environment interact to produce idiosyncrasies and hence heterogeneity?'; 'How can we theorize the sensing of environmental changes and the adaptive capacity involved without recourse to conscious cognition, structure or any kind of rules, routines or heuristics?'; And 'how can iterative, situation-specific and ongoing adaptations evolve and cohere over time to generate a semblance of consistency in collective actions that is nevertheless inimitable?'

Our assertion is that what EM and TPS are really straining to articulate is an underlying refined empirical sensitivity to environmental affordances, and an associated shared habitus that enables firm actors to skillfully respond accordingly to such environmental solicitations. For us, the origins of DC derive from this non-cognitive, microfoundational substrate that is

"sticky" and idiosyncratic and hence accounts for heterogeneity among firms. Teece aptly points out that any attempt to identify the microfoundations of DC "must be necessarily incomplete, inchoate, and somewhat opaque…Otherwise sustainable competitive advantage would erode with the effective communication and application of dynamic capability concepts" (Teece, 2007: 1321). In other words, paradoxically, if DC can be easily defined and communicated through language and conscious cognition, competitive advantage deriving from it would not last. Our non-cognitive microfoundational framework explains why DC resist cognitivist explanations.

Insert Table 1 about here

NON-COGNITIVE MICROFOUNDATIONS OF DYNAMIC CAPABILITIES: AFFORDANCES, EMPIRICAL SENSITIVITY AND HABITUS

Our central argument is that the tensions surrounding idiosyncrasies, tacitness and inimitability derives from an underlying commitment to an essentially cognitivist understanding of human behavior; one that places abstract information processing and conscious deliberation at the core of its theoretical explanations. It is therefore unable to account for capabilities that are "inchoate, and somewhat opaque." This is why Teece struggles to account for it using expressions like "non-routine" and "something else." The same goes for EM with their "non-analytic," "experiential" and "iterative" emphasis. Both appear to be straining towards a non-cognitivist understanding of human action.

We use the term "non-cognitive" to mean action that is not motivated by conscious thought or that involves information processing and abstract analysis. Cognitivist accounts of human capabilities typically assume symbol manipulation and abstract, inferential reasoning as the basis of intelligent action. While much conscious and deliberate thinking and reasoning does go on in firms regarding strategic concerns, our argument is that this capacity for reflection and rational analysis rests upon a firm's substrate of adaptive capabilities. For us, it is this non-

cognitive substrate that enables information processing, rational analysis and deliberate action to take place. It helps explain how skill mastery and expertise in many fields of endeavor accrue through the honing of local adaptive actions without relying on mental representation (Dreyfus, 2002: 378). This substrate has been overlooked in current theorizing on DC and it explains why firm idiosyncrasies persist and are hence inimitable. A comprehensive theory of DC, therefore, must address this substrate which provides the microfoundational source of DC. A non-cognitivist framework emphasizes the non-deliberate emergence of DC as an aggregate effect of in situ skilled, adaptive actions; actions that involve a refined empirical sensitivity and an internalized firm habitus. These are tacit capabilities that can be shown and demonstrated but not easily described; it explains their opacity. A non-cognitive microfoundational framework of intelligent behavior draws on an ecologically-based account of human action and it is this that provides the basis for an alternative understanding of DC.

We start by outlining this ecological approach underpinning our framework and then elaborating on three key concepts – affordances, empirical sensitivity and habitus to show how a tacit substrate of capabilities is nurtured through a firm's intense close-quarter engagement with its extant environment.

An Ecological Understanding of the Development of Non-Cognitive Capabilities

An ecological approach to understanding intelligent human action (Bateson, 1972; Gibson, 2015; Merleau-Ponty, 2012), takes as its starting point the 'reciprocity' that characterizes the organism/environment nexus. Living systems and especially human systems, respond to their environment not through passive adaptation, but through actively selecting aspects of it that provide opportunities for its survival and growth. We create the world we perceive by selecting aspects of reality (Bateson, 1972: vii) and constructing our own *Umwelt* (experienced world) comprising 'carriers of significance' to aid our survival and growth (von Uexküll, 2010).

This emphasis on the active role of perception and selection of the environment provides the intellectual backbone for an ecological understanding of the emergence of firm capabilities at its most primitive level. It enables us to understand how a skilled adaptive substrate of firm capabilities is developed, refined and socially-transmitted through close-quarter firm/environment interactions. What a firm finds 'out there' in terms of opportunities available is not some singular objective reality, but a *consequence of the firm's own search activity*. It relies heavily on a heightened sensitivity to the environment nurtured through prolonged engagement with the latter.

Furthermore, a firm response to its environment is shaped not simply by what it immediately perceives, but by its cumulative experience of antecedent environmental excitations recorded in its collective neural system; past encounters idiosyncratically predisposes a firm in its future engagements. Its responses, therefore, are not merely reflexive 'effects', nor are they deliberately or consciously intentional. Prior effective practices honed in response to the ever-changing environment shape a firm's predisposition which then prepares it for future engagements. Environmental sensitivity and a nurtured predisposition then provide an alternative ecologically-based understanding of how firms become successful in exploiting their environmental situations. In what follows we elaborate on three key features of this non-cognitive microfoundational framework for DC based on an ecological understanding of human action.

Affordances

Affordances are the milieu of possibilities an environment proffers or furnishes for an active participant immersed in it. Thus, "a fruit says 'Eat me'; water says 'Drink me'; thunder says 'Fear me' …" (Koffka, 1935: 7, in Gibson, 2015: 129). There is a "demand character" or an "invitation character" (Gibson, 2015: 130) about the environment that solicits a response. Sensing an affordance, therefore, involves non-cognitively "perceiving a value-rich ecological

object" (Gibson, 2015: 132); the possibilities an environmental affordance proffers are numerous and a priori unspecifiable. Thus, a house can be a home but it also be used as rental accommodation through Airbnb. Similarly, a car can be for personal use but it can also be used to generate additional income as a taxi service through Uber. Affordances are fundamentally "unspecifiable" a priori because their features can always be co-opted to produce novel functions and utilities (Felin, Kauffman, Mastrogiorgio, & Mastrogiorgio, 2016; Garud, Gehman, & Giuliani, 2016; Gould & Vrba, 1982). For example, the spray WD40 developed in the early 1950s to remove moisture from electrical parts is now being used for entirely different purposes including the removal of stains from carpets to spraying on fishing lures to catch salmon!

Furthermore, there is a shared dimension involved in the perception of affordances. A community with a developed habit of sitting on chairs will view any terrestrial surface that is "horizontal, flat extended, rigid, and knee-high relative to a perceiver" (Gibson, 2015: 120) as affording sitting on. But to a community used to squatting, such a possibility may not be countenanced. Similarly, apps such as Twitter and WhatsApp afford tweeting and messaging to a social media savvy community with smartphones and wireless connectivity; everyone growing up in such a community knows what it is and what the different emoji and text-speak mean. But to a community not socialized into or lacking this social media all this would be meaningless.

Finally, affordances are relative and every surviving and thriving community occupies a certain *niche* in its environment. Each community manipulates environmental affordances to its advantage to ensures its members a greater chance of survival. Other communities carve out and perceive different affordances that help support their own different ways of life. In this manner there is an irreducible and idiosyncratic complementarity between a participating community and its environment. The same logic applies for a firm.

Empirical Sensitivity

Empirical sensitivity refers to a community's idiosyncratically refined capacity for making fine discriminations of environmental solicitations to ascertain what it affords members of that particular community. This capacity to sense differences and make fine distinctions are pre-cognitive (Dreyfus, 2002: 167); our perceptions are far more fine-grained and sensuously-detailed than what can be linguistically captured. This refined sensitivity to differences nevertheless exists and it enables us to achieve a high level of fidelity in our observations so that we are able to respond effectively in uncertain and changing environments. The Canadian Inuit, for instance, have a capacity to finely discriminate between many different types of snow and to respond accordingly. Their intimate understanding derives simply from constant and prolonged close-quarter encounters with a wide range of different snow conditions (Krupnik, Aporta, Gearheard, Laidler, & Holm, 2010). Being able to sense, discriminate and respond appropriately to different snow conditions is not simply a matter of choice for the Inuit; it is a matter of life and death. Every member of the tribe is brought up to know such differences as part of their life skills.

Similarly, this sensitivity and capacity for fine discrimination is also evident in many competitive sports. American football players, for instance, are more able to judge and negotiate small gaps wearing their shoulder-pads than many other athletes (Higuchi, Murai, Kijima, Seya, Wagman, & Imanaka, 2011). And they are better able to judge while running than while walking! Long hours of training involving running into small emerging gaps while wearing shoulder-pads and helmets has enabled these players to develop an embodied sensitivity to situational affordances and to capitalize on them at the right moment.

The possibilities an environment affords depends on this collectively-shared and finely-honed observational capacity to discriminate among the situations. Such an empirical

sensitivity provides the foundations for the development of an accompanying set of socially-transmitted predispositions that Bourdieu (1990) calls "habitus."

Habitus

Habitus describes a "durable, transposable set of dispositions" (Bourdieu, 1990: 52) that is "practical rather than discursive, prereflective rather than conscious…durable though adaptive, reproductive though generative and inventive, and…transposable to others" (Swartz, 1997: 101). Habitus provides a consistency in collective actions that does not presuppose conscious cognition and deliberate intentions. It explains the non-deliberate coordination and orchestration of productive actions within a collective without the need for explicit structures, systems, rules and procedures.

Habitus is an internalized "*tendency, propensity, or inclination*" (Bourdieu, 1977: 214, emphasis original) that underpins the "art of inventing" (Bourdieu, 1990 : 55) and enables actors to spontaneously fashion effective novel responses to the changing circumstances they find themselves in. While there may be specific differences in how habitus is expressed in practice by members, such actions taken nevertheless exhibit collectively identifiable features. Members of communities and firms draw from their acquired habitus to express themselves individually and to perform effectively (Reckwitz, 2002 : 251) when faced with novel situation. In this way, their everyday adaptive actions help regenerate and modify the social orders they have acquired. Understood in these practice terms, a "firm" is not so much a solid entity but a process involving the gradual *firming up* of interactions, power relationships, norms of excellence, and practices that have historically proven effective in dealing with environmental situations. Habitus makes a firm what it is; its modus operandi defines how things are done.

A firm's habitus is the product of a complex history of accumulated practices comprising a refined empirical sensitivity to affordances and an associated set of predispositions and tendencies. It incorporates the active "presence of past experiences" so that there is consistency

in firm action even without the need or existence for explicit rules, routines or norms (Bourdieu, 1990 : 54). In essence it is more an idiosyncratic *style* of engagement (Dreyfus, 2009 : 48) than a set of explicit rules, routines or even heuristics. This habitus or style enable a firm's actors to deal with novel and changing circumstances by drawing from its repository of practices to effect appropriate responses. Such responses, while often improvisational, nevertheless still appear eminently sensible or reasonable to those within that particular collective. In both Bourdieu's and Dreyfus's account, therefore, what unifies a firm's action is this style or habitus that is unique to it; a way of dealing with things that is idiosyncratic to that particular firm.

To summarize, habitus governs how "things, situations and people show up and matter to us" (Spinosa, Flores, & Dreyfus, 1997: 20). It ensures that actions are "orchestrated" non-deliberately; no explicit plans, structures and systems are needed to guide such action. Habitus is a generative scheme that makes possible "an infinite number of practices that are relatively unpredictable…but (that are) also limited in their diversity" (Bourdieu, 1990: 55). Each action undertaken to resolve situations encountered sensitizes us to their affordances and helps further extend the established set of social practices that then prepare members for future encounters. Each act issues from a previous one and each act adds to the entire collective repository by reshaping its schemes of perception and action for future encounters with as-yet unforeseeable circumstances. Continuity and novelty in response is what characterizes everyday skilled adaptive actions. From a firm's point of view, the repository of previous skilled adaptive experiences it has amassed over time aggregates into a set of predispositions, tendencies and practices that is unique to it. This is what underpins DC and explains why it is unique and idiosyncratic to a firm and what differentiates it from its competitors.

The terms affordance, empirical sensitivity and habitus help us to address the challenges of firm idiosyncrasies, the tacitness of DC and their inimitability. Whereas empirical sensitivity points to a refined attunement to environmental affordances acquired through extended coal-

face interactions, habitus points to the collective predispositions and practices that firms develop from such adaptive actions taken. Firms perceive, sense and seize situations differently because their sensitivity to affordances and their predispositions to act differ and this accounts for the observed heterogeneity among competing firms.

Figure 1 displays in a diagrammatical form the relationship between affordances and the sensitivities and predispositions that are in turn developed and intertwined with the practices of the firm. Beginning with the circular loop on the left-hand side of Figure 1, we have a rich landscape of affordances that is part of a firm's environment and this is reciprocally linked to empirical sensitivity in the center of Figure 1. As firms, through individual encounters, develop the collective capacity to make finer and finer discriminations, it continually changes how environmental affordances are perceived.

As the firm learns to non-cognitively perceive affordances and to respond appropriately over time it develops a skilled adaptive capacity that is encapsulated in its habitus. We show this as a circular loop on the right-hand side of Figure 1. Once these actions become sedimented and incorporated into its habitus, it simultaneously enables and constrains future responsive action. Habitus comprises the repository of cumulative practices that have proved successful over time and is unique to a particular firm. Whereas the circular loop on the left-hand side illustrates continuous micro-adjustments in perception and empirical sensitivities, habitus is the durable style of engagement that emerges from such ongoing firm encounters. Overall, our framework shows that the relationship between the affordances, empirical sensitivity and firm habitus is one of continuous reciprocity.

Insert Figure 1 about here

FROM COGNITION-BASED CAPABILITIES TO NON-COGNITIVE ADAPTIVE ACTION

We now turn to integrating our non-cognitive microfoundational framework with the extant literature on DC. In order to situate this non-cognitivist framework in relation to the current literature, we begin with Tsoukas's (2015) onto-epistemological framework which describes the spectrum of theories of action possible, ranging from detached action typified by abstract analysis and cognitive manipulation, to deliberate problem-solving action that relies on simple rules and heuristics, and then finally to the non-cognitive skilled adaptive actions that we argue provides the microfoundational basis for a firm's DC. The extended framework detailing these distinctions is displayed in Figure 2. We illustrate each mode of action by drawing on Salvato's (2009) detailed example of Alessi's DC.

Insert Figure 2 about here

Our extended DC framework elaborates on how different types of effective firm actions are possible (Chia & Holt, 2006; Chia & Rasche, 2015; Tsoukas, 2015). On the one hand, senior executives, strategy planners and other decision makers are more likely to engage in *detached action* because they are usually remote from the coal-face; their action comprises deliberate cognition and detailed analyses. This approach entails selectively "bracketing" immediate practical concerns and dealing with them in isolation so that thinking "tends to be analytical, either deductive or narrative, or a combination of both" (Tsoukas, 2015: 71). For example, Teece (2007: 1326) highlights the importance of "gathering and filtering technological, market, and competitive information from both inside and outside the enterprise, making sense of it, and figuring out implications for action." The outcome of this analytical "figuring out" are the identifying of tasks and the prescribing of "competencies," "procedures," "rules," "routines," and "best practices" for dealing with the problems identified. Detached action presupposes

capabilities that are "homogeneous and substitutable" (EM: 1106). Within our extended DC framework, this detached cognitive process is depicted at the top in Figure 2.

Detached action is illustrated, in Salvato's analysis of Alessi's "recipe-book" for new product development (NPD). There was a clearly stated sequence of events that NPD capabilities followed, starting with designers using a common documentation template and initiating several iterations of interactions between designers, suppliers, company performance targets and costs. 40% of projects analyzed revealed this standardized "best practice" at Alessi.

The analytical approach differs significantly from Teece's "entrepreneurial actions" or Eisenhardt's "simple, experiential rules" or "rational heuristics" all of which eschew detached, analytical activity. Instead, this type of action, while conscious and problem-oriented, does not involve detailed analyses; it depend "less on existing knowledge and much more on rapidly creating situation-specific new knowledge" (EM: 1112). So, there is an important distinction between detached action and this kind of deliberate adaptive action that is largely experiential and iterative.

We can see this in the departure from the "recipe-book" at Alessi. These came about in situation-specific issues, ranging from critical issues raised by Alessi employees to several ad hoc changes and modifications resulting from interaction with "unusual" suppliers and topics which led to changes in the way the NPD evolved. Both, internal and external issues led to important changes in the way the capability unfolded. These adaptations resulted in local rules of thumb "geared to reproduce select improvisations observed by managers in previous years as internal or external mutations" (Salvato, 2009: 393).

To accommodate the distinction between detached, planned action and this deliberate experiential and iterative response, we call this *deliberate adaptive action*. This action relies on "fragile" and "unstable" simple rules and rational heuristics rather than on established routines, procedures or best practices. Practitioners are thematically aware of their actions but

are not completely detached from their immediate task-related activities. In Heidegger's (1962: 102-105) terms, deliberate adaptive action happens in response to a perceived malfunction or a breakdown in function and this attracts our awareness and attention. When this happens, practitioners rely on simple rules of thumb to deal with the problem faced in a "fast and frugal" way. "Simple rules are idiosyncratic heuristics *that are often consciously understood*, combined with improvisation" (Bingham, Heimeriks, Schijven, & Gates, 2014: 1698, emphasis added); they are "*deliberate rules* of thumb for guiding and executing action" (Bingham & Eisenhardt, 2011: 1448, emphasis added). These rules are specific to tasks, such as country entry, and idiosyncratic to groups within a firm. They point to deliberate adaptive action taking place in situation-specific circumstances. We locate this deliberate adaptive action in the middle of Figure 2.

In the Alessi example, Salvato illustrates how deliberate adaptive actions are codified and developed into routines and procedures for future NPD processes. He labels these examples "recombinant project sequences," wherein "managers replicate past experiments by mindfully formalizing a selection of them into organizational routines" (Salvato, 2009: 400). By selecting and codifying past experiments, firms can adapt their "recipe-book" and modify their processes of detached action. Yet, what remains unaccounted is the underlying substrate that leads to a reaction to a *perceived* situation-specific problem in the first place. As Salvato acknowledges, "the interpretive framework adopted by managers in deciding which behavior should be reinforced and the underlying cognitive processes may thus be more nuanced than standard learning theory suggests" (Salvato, 2009: 400). The emphasis is *reaction* to a perceived problem situation. But *what* stimulates and causes this reaction remains unaccounted for.

In his multiple attempts to refine DC, Teece subsequently points to "non-routine" action (Teece, 2007) as a key element; a "something else" (Teece, 2012) that makes for DC. This something else is the microfoundational substrate that we call non-cognitive *skilled adaptive*

action. It describes what happens in everyday situation where objects/events are not "theoretically" known but are effortlessly co-opted for use into our daily activities; they form an extension of our being. Heidegger (1962: 107) describes it as a state of "non-thematic circumspective absorption." In such a state, practitioners are absorbed in their immediate concerns "*without noticing them or trying to spell them out*" (Dreyfus, 1991: 90, our emphasis). Non-cognitive adaptive actions taken are *habitus*-driven; no conscious cognition or mental representation is involved (Bourdieu, 1990: 56-61). This skilled adaptive capacity describes the numerous occasions in daily life where we unthinkingly respond to overcome obstacles and predicaments encountered. The situation is akin to the effortless manner by which we are able to maintain our balance while walking and to unconsciously micro-adjust our way through crowds at traffic crossings for instance without ever being aware of what we have achieved. When this primitive "substrate" capability is disrupted or rendered inoperative, only then is deliberate adaptive action necessary. This non-cognitive skilled adaptive action is depicted at the base of Figure 2.

In skilled adaptive action, practitioners spontaneously differentiate and respond in situ, making ever-finer adjustments unthinkingly so that their efforts blend seamlessly with the "grain of the world's becoming" thereby "bending it to their evolving purpose" (Ingold, 2011: 211). In this adaptive mode, practitioners are attuned to minute differences in environmental conditions, sense the affordances available and effortlessly capitalize on them. All this happens without conscious cognition (Dreyfus, 2002: 367). Within a firm, this tacitly refined empirical sensitivity and the nurtured habitus combine to create "fast and frugal" rational heuristics that are then used to effect "entrepreneurial action." Without this substrate comprising a refined sensitivity and shared habitus, no such rational heuristics or firm entrepreneurial action would be possible.

To summarize, from a cognitivist viewpoint, abstract analyses and deliberate intention drive purposeful actions. End-goals are imagined and pre-established before any meaningful actions are taken. At a more minimal problem-solving mode, actions are still cognitive and deliberate but this time guided by explicit "simple rules" and "rational heuristics". In contrast, a non-cognitive view emphasizes the importance of a nurtured empirical sensitivity to situational affordances and the predisposition to respond accordingly. All this happens without necessarily passing through conscious cognition. In our extended DC framework (Figure 2) we show how this non-cognitive understanding of collective action adds to current theorizing by emphasizing the existence of a substrate that we call skilled adaptive action. This substrate constitutes the non-cognitive microfoundations of DC. Analyzing the current literature we discern a spectrum ranging from TPS's attempt to define DC in detached analytical terms to Teece's (2012) subsequent attempt to add the notions of "non-routine" and "entrepreneurial action" involving "sensing, seizing and transforming" as part of DC. Similarly, EM, Bingham and Eisenhardt (2011) and Eisenhardt and Sull (2001) have moved from "best practices" to "simple rules" and "fast and frugal" "rational heuristics" in their explanatory attempts. Whilst we are sympathetic to these more progressive efforts, our argument is that they are theoretically constrained by their cognitivist framing and lack a non-cognitivist framework for understanding spontaneous adaptive action. From our ecological perspective, the prior acquirement of a level of empirical sensitivity to affordances is a prerequisite for recognizing the multiple possibilities available for creative responses. Thus, the successful firm, entrepreneur or manager has already acquired these skilled adaptive capabilities through immersion in social practices so that they are able to respond effectively to opportunities proffered by the environment. This skilled adaptive capability comprises a refined sensitivity to affordances, and a nurtured predisposition to capitalize on such affordances in situ.

MECHANISMS AND SUPERIOR OUTCOMES ARISING FROM SKILLED ADAPTIVE ACTION

In this section we theoretically elaborate on the mechanisms and outcomes of skilled adaptive action. We argue that skilled adaptive action leads to two main outcomes – entrepreneurial fitness and adaptive advantage as sources of competitive advantage. We also identify two mechanisms based on our non-cognitive microfoundational approach that lead to superior outcomes – optimal grip and exaptation. We explain how the two mechanisms, cultivated through direct interaction with the environmental affordances, generate superior outcomes. We also address the challenge of core rigidities that can cause firm failure. We elaborate on two mediating processes – interstitial spaces and serendipity arrangements – that can enable firms to avoid capabilities becoming too focused on the existing competitive landscape and becoming inflexible as the external environment changes. Figure 3 illustrate the mechanisms and outcomes that arise from our non-cognitive microfoundations of DC.

Insert Figure 3 about here

Skilled adaptive action is the substrate of the extended DC framework. It does not work in isolation from cognitive actions. Action moves from skilled adaptive to deliberate adaptive and detached action when we lack the relevant skills, things go wrong, or situations are too complex, thus forcing us to reflect or deliberate explicitly in a detached way. However, in this section we restrict ourselves to elaborating on the mechanisms within skilled adaptive action and show how they lead to entrepreneurial fitness and adaptive advantage. Our starting point is the top of Figure 3, where we present skilled adaptive action.

Affordances-empirical sensitivity. We posit that it is the reciprocity between affordances and empirical sensitivity that leads to superior sensing, seizing and shaping. To recall, our terms, affordances and empirical sensitivity aim to replace the existing separation between the firm and the environment and to posit an inextricable firm-environment nexus. Whereas Teece

et al. highlighted "analytical systems" and Eisenhardt et al. highlighted "simple rules," our focus is on the reciprocity between affordances and empirical sensitivity that leads to innocuous adaptive actions and judgements carried out unthinkingly and spontaneously in situ. Our use of the terms in situ is important because it emphasizes the situated and unreflective nature of the response to affordances. Several empirical studies have highlighted the importance of local and situation-specific adaptations. For example, Garud et al. (2011: 756) demonstrate skilled adaptive action "enacted locally by 3M employees, afforded them multiple agentic orientations simultaneously." Similarly, Salvato's (2009: 402) study of Alessi demonstrates the "relentlessly locating, refining, and reproducing potentially adaptive innovations emerging from local experimentation."

The main mechanism through which reciprocity between affordances and empirical sensitivity leads to superior adaptation is optimal grip (Dreyfus, 2002; Merleau-Ponty, 2012); the ability to unthinkingly make subtle and fine discriminations and adjustments instinctively (left-hand side of Figure 3). This mechanism enables a skilled practitioner to adjust and improvise to improve situational outcomes afforded by environment. For example, Merleau-Ponty (2012: 316) notes how we automatically orient our body when viewing paintings in an art gallery; we adjust our distance accordingly and our posture as necessary to achieve an "optimal distance … towards which the whole perceptual process tends." Similarly, Rietveld (2008: 980-81) shows how an architect "notices that the door in its architectural context is incorrect and immediately senses two relevant alternatives (make the door more narrow or make it higher), and, what is more, he responds immediately to the best of these two possibilities for action (saying: 'Make it higher', or by an equivalent non-verbal reaction)." Attaining an optimal grip on the situation enables a skilled practitioner to let himself/herself be drawn to iteratively respond to the situation in its context, until finally reaching a point of correctness. We contend that it is this iterative process of arriving at a point of 'correctness'

that Steve Jobs alluded to when he described "people [at Apple] meeting up in the hallways or calling each other at 10:30 at night with a new idea, or because they realized something that shoots holes in how we've been thinking about a problem" (Teece, 2012: 1399).

Optimal grip is an endogenous relation between the lived experience and the action performed. Rather than take a step back from action to deliberate, the mechanism of optimal grip is an ongoing and continuous adjustment to the situation at hand. Our assertion is that the cumulative outcome of optimal grip is better firm performance through the intimacy of understanding involved in shaping responses to the business context (Gavetti, Helfat, & Marengo, 2017).

Empirical sensitivity-habitus. The reciprocity between empirical sensitivity and habitus addressed the issue of how collective predispositions that are accumulated over time are carried forward into a specific responsive action taken. When Teece noted that, "activities must be performed *expertly* if the firm is to sustain itself as markets and technologies change" (Teece, 2012: 1396, our emphasis), such expertise is not reposed on rules or routines but on empirical sensitivity and its associated habitus. Expert skills cannot be detached from the practitioners themselves; it is part of their modus operandi. Our focus is on mechanisms within the non-cognitive substrate that lead to emergence of new practices.

The main mechanism through which the reciprocity between empirical sensitivity and habitus leads to superior adaptation is exaptation (right-hand side of Figure 3). Exaptation denotes the process of how environmental affordances are often surprisingly co-opted for novel uses thereby creating fresh value. The term has its origins in evolutionary biology, where it refers to "features that now enhance fitness, but were not built by natural selection for their current role" (Gould & Vrba, 1982: 4). Recently, several management scholars have used the concept of exaptation to illustrate "the repurposing of artifacts, technologies, processes, skills, organizations, and resources for emergent uses that they were not (initially) designed for" (Dew

& Sarasvathy, 2016: 167). For example, Andriani et al. (2017: 335-6) list several discoveries in the medical sector that have been exapted for a different purpose than their original use. From Botox and Viagra to Mustargen (chemotherapy drug) and laughing gas, these discoveries originated in different arenas to the ones they are currently used. Exaptation can lead to the creation of new market niches and produce novel reconfiguration of resources and capabilities.

The capacity for exaptation is inextricably linked to a deep familiarity and sensitivity to affordances which then leads to the ability to see ever-more possibilities available for innovation and exploitation.

Direct interaction. Optimal grip and exaptation work through direct interaction (middle of Figure 3) between firm and environment. The collective nurturing of a capacity to "read" environmental affordances comprises a quality of seeing pristinely and "naively" and hence following closely the unfolding contours of emergent situations. Given the tacit nature of non-cognitive mechanisms, direct interactions enable tacit-to-tacit sharing of skilled adaptive action. Nonaka and Takeuchi (2011: 61), for example, identify the naive ability to experience concrete reality as it is in itself, as a crucial quality of strategic success. They insist that a "keen sensitivity to change" and the ability to grasp the essence of situational particulars is what underpins sustainable firm success (Nonaka, Toyama, & Hirata, 2008: 59). To justify their claim, they use the example of Soichiro Honda, the founder of the Honda group. Honda had a legendary habit of crouching and observing intensely for hours, a motor cycle rider racing one of his Hondas. He believed in the importance of pure seeing as a founding basis of superior performance; "When I look at a motorcycle, I see many things" says Honda (Nonaka et al., 2008: 59). Similarly, the Japanese industrialist Konusuke Matsushita has insisted on cultivating a *sunao* mind as the basis of effective action at all levels of an organization. He writes: "The untrapped, open mind - *sunao* - …is a temperament that allows one to see things as they really are…We have made it a regular policy at Matsushita Electric to cultivate this *sunao* mind, in

the conviction that it enables us to perceive the real state of all things in society" (Matsushita, 2002: 45). The cultivation of this shared capacity for pristine experiencing and "pure seeing" through direct interaction is crucial for skilled adaptive action and supports the need for senior managers to engage directly with bottom-up processes (Barney, Foss, & Lyngsie, 2018).

Interstitial spaces and serendipity arrangements. As Figure 3 shows (left-hand side dotted arrows), optimal grip can lead to core rigidities (Leonard-Barton, 1992). As firms achieve finer and finer sensitivity to their environmental affordances, they develop expertise that matches the existing situation. However, exogenous changes, such as shifting customer demands, new technological breakthroughs and competitor actions, can make the expertise obsolete. Enduring examples such as Polaroid's inability to respond to changing industry environment (Tripsas & Gavetti, 2000), NCRs struggle to change its "Dayton mentality" in response to external changes (Rosenbloom, 2000), and Nokia's inability to adapt to smartphones (Vuori & Huy, 2016) illustrate this problem well. Despite cognitive understanding of the shift in the competitive landscape and technology, these companies failed to adapt.

So what differentiates firms that fail to adapt and ones that do? We identify two key processes that help prevent optimal grip from becoming core rigidities and thus to ensure successful adaptation (center of Figure 3). Firstly, direct interaction in "interstitial spaces" (Furnari, 2014) enable skilled practitioners to refine their empirical sensitivity and hence expand the horizons of affordances available. Interstitial spaces are "microlevel situations of interaction between individuals. Thus, interstitial spaces identify "here-and-now" episodes of interaction (Furnari, 2014: 443) which can generate new practices. For example, an eclectic set of actors came together at the Homebrew Computer Club (HCC) which unexpectedly led to emergence of a new "computer hacking practices" (Coleman, 2013; Magaudda, 2010) in the 1970s.

Secondly, and in the similar vein to interstitial spaces, "serendipity arrangements" (Garud, Gehman, & Giuliani, 2018) enable firms to avoid core rigidities and instead "exapt" new value from existing technologies and discoveries. Serendipity arrangements nurture "positive accidents" by fostering interactions and connections with a multiplicity of actors and institutions making up the entrepreneurial ecosystem" (Garud et al., 2018: 134). In a remarkably similar description to Steve Jobs characterization at Apple, 3M also illustrate the innocuous and everyday direct interactions that lead to serendipitous connections. "Innovation has thrived at 3M because people talk. They strike up lively conversations in hallways, cafeterias and labs. They talk across departments and divisions. They meet to share ideas in brainstorming sessions and forums" (3M, 2002: 33; cited in Garud et al., 2018: 131).

Interstitial spaces and serendipity arrangements are ephemeral states, hence easy to overlook. However, they play an important role in building idiosyncratic and tacit engagement with context-specific situations. Done expertly, these spaces and arrangements engender a creative capacity to sense, shape and seize opportunities that others would miss. Equally, their transient nature means that managers can gloss over their importance for building DC.

Entrepreneurial fitness. The main outcome of DC relates to "fitness." Two key terms have advanced our understanding of key advantages arising from DC - technical fitness, and evolutionary fitness (Helfat, Finkelstein, Mitchell, Peteraf, Singh, & Winter, 2007; Helfat & Peteraf, 2009). Technical fitness refers to "how effectively a capability performs its intended function when normalized (divided) by its cost" (Helfat et al., 2007: 7). The focus here is on how well a capability performs, relative to its cost. Evolutionary fitness, on the other hand, refers to "how well a dynamic capability enables an organization to make a living by creating, extending, or modifying its resource base" (Helfat et al., 2007: 7). Evolutionary fitness focuses, not just on how well a capability performs, but also how a firm is able to adapt to changing market demand and competition.

"Arguably, entrepreneurial fitness ought to have equal standing with evolutionary fitness" (Teece, 2007: 1321). Entrepreneurial fitness is about "figuring out the next big opportunity and how to address it" (Teece, 2007: 1346). One way of thinking about entrepreneurial fitness is that it amplifies a firm's evolutionary fitness; it is a firm's capability to create, extend and modify its resource base by identifying and seizing new opportunities. A firm organized to create and capitalize on entrepreneurial opportunities has a greater capacity to shape its business landscape. The difference between firms that are entrepreneurially fit, compared to ones that are focused on existing opportunities can be illustrated by the contrasting fates of Kodak and Fujifilm in response to the changing landscape of the photography industry in early 2000s. Whereas Kodak filed for bankruptcy in 2012, Fujifilm acted entrepreneurially and diversified into new industries and products (Komori, 2015). As Nonaka et al. (2016: 172-3) state, what differentiated Fujifilm from Kodak was their Fujifilm Way which "stresses the importance of direct interactions with customers, colleagues, and competitors." Similarly, the pharmaceutical company, Eisai, also emphasizes direct interaction with the company environment. "In so doing, every employee is expected to grasp the essence of reality and obtain insights into future opportunities" (Nonaka et al., 2016: 173). The focus on direct interactions with the external environment illustrates how firms can nurture the capacity to tacitly sense and seize new opportunities.

Adaptive advantage. Our proposition is that entrepreneurial fitness enables firms to lower the cost of creating and responding to new opportunities, leading to adaptive advantage as the basis of sustainable competitive advantage (Reeves & Deimler, 2011). Adaptive advantage focuses on a firm's ability to detect and act on weak signals, to experiment rapidly and frequently in different arenas with new products and new business models and to manage complex and interconnected ecosystems. It enables firms to manage the resource

reconfiguration process on a continuous basis (McGrath, 2013; Rindova & Kotha, 2001), leading to competitive advantage over rivals that fail to adapt on an ongoing basis.

To summarize, our focus in this section was to explain the mechanisms and the outcomes of non-cognitive microfoundations of DC. Again, we emphasize, our aim is to elaborate on the "something else" that is idiosyncratic and tacit in action. We do not claim that non-cognitive microfoundations fully account for better outcomes; they are necessary but not sufficient conditions for success. As our extended framework illustrated, detached action and deliberate adaptive action also play a role, particularly when things go wrong or there are breakdowns in the smooth unobtrusive action. In this section, we focused on the mechanism within the non-cognitive substrate - optimal grip and exaptation - which leads to situation-specific and spontaneous adaptation that cumulatively shapes the business landscape, developing entrepreneurial fitness, and providing adaptive advantage. We also identified how firms can achieve this by engaging in interstitial spaces and serendipity arrangements which generate new tacit knowledge and create new practices.

DISCUSSION

Strategy scholars have typically relied on a cognitivist worldview to account for a firm's DC. Our ecologically-informed, non-cognitivist framework, on the other hand, pays "close attention to the work done by people" within organizations and helps us appreciate "the skill by which people make do with the resources they have in their everyday lives" (Johnson, Melin, & Whittington, 2003: 118). It makes an important distinction between planned, deliberate actions and the more innocuous everyday micro-adaptive actions that regularly takes place unthinkingly and unceremoniously at the coal-face of businesses which actually helps build up a firm's strategic capability over time (Chia & Holt, 2006; Chia & Rasche, 2015; Tsoukas, 2015). Such a skilled adaptive capacity is characterized by a smooth and unobtrusive responsiveness in dealing with environmental exigencies.

We began the paper by articulating three key challenges facing DC scholars: 1) the origins and significance of idiosyncrasies; 2) whether DCs are explicitly or tacitly acquired; and 3) why DCs are inimitability and non-replicable. The roots of these challenges lie in the tensions identified in the two seminal articles on DC by TPS and EM and their subsequent attempts, as well as that of others, to elaborate this concept. We framed these tensions in terms of the individual-firm-context nexus and showed how intensive close-quarter encounters in situation-specific circumstances aggregatively generates a heightened environmental sensitivity and an associated set of idiosyncratically-nurtured predispositions within the firm. This, we explain is why a firm's DC are elusive and resistant to imitation by its competitors. We then developed a non-cognitive microfoundational framework that explains the origins of the idiosyncratic, tacit and inimitable nature of DC.

Drawing on an ecological approach, we showed how skilled adaptive actions as embodied responses to environmental solicitations, points us to the existence of a non-cognitive substrate underpinning firm DC. Whilst detached analyses and deliberate adaptive actions play an important role in determining firm outcomes, we maintain that they ultimately rest on this non-cognitive substrate. In other words, in practice, all intelligent actions ultimately emanate from this substrate of adaptive capability. Our focus has been on explicating this substrate as the microfoundational basis of DC.

We introduced three terms – affordances, empirical sensitivity and habitus – to elaborate on our non-cognitive framework. The key to understanding this framework is appreciating how individuals, firms and environments are inextricably intertwined in an intimate and reciprocal manner. From this ecological viewpoint, the environment is always pregnant with meaning and possibilities for a firm well-attuned to it. Environments solicit appropriate responses from skilled participants and it is the firm's ability to sense, respond and capitalize on such environmental possibilities that defines its DC.

From this non-cognitivist viewpoint, the traditional strategic approach of rationally identifying and analyzing environmental challenges and then devising a strategic plan to meet such challenges, underestimates the way firm members at all levels actively contribute towards the shaping of firm strategy. Any coherent and effective strategy must rest upon a firm's collective ability to sense subtle environmental changes on a day-to-day basis and then to respond effectively to them through their acquired habitus. All of this happens spontaneously without much pre-thought. This explains the oftentimes improvisatory nature of responses that are unceremoniously taken at the coal–face of businesses without any reliance on coordination or direction from top management or even awareness on their part. More than analytical systems, best practices, simple rules or heuristics, this skilled adaptive capacity comprises an internalized firm habitus or modus operandi that enable firm actors to generate an ever-expanding range of added-value products/services to meet the ever-changing needs of their customers.

Future Research on Skilled Adaptive Action

Our framework suggests several empirical propositions for future research. An ecological understanding of human action alerts us to the fact that firm participants perceive and respond differently to environmental affordances because of idiosyncratic differences in empirical sensitivity and habitus. Thinking in terms of affordances, empirical sensitivity and habitus enables us to appreciate the essentially idiosyncratic nature of firm capabilities and their responses. This can be empirically tested in future research.

Firstly, we need more research on understanding optimal grip and exaptation (see Figure 3), the two mechanisms through which skilled adaptive action unfolds. The capacity for optimal grip and exaptation is inextricably linked to a deep familiarity and sensitivity to affordances which then leads to the ability to see ever-more possibilities available for innovation and exploitation. Skilled practice is a nuanced and creative responsiveness of the practitioner to the

subtle and ongoing changes taking place and the evolving affordances proffered by the environment. This suggests that we need longitudinal qualitative research that showcases how firms develop nous and learn to cope skillfully in an expanding variety of environmental situations. For example, through an in-depth ethnographic study Sele and Grand (2016: 14) demonstrate how "seemingly similar routine interactions do not always lead to the same outcomes and that thinking and applying "the new" is an uncertain process that cannot be envisioned a priori." By focusing specifically on optimal grip and exaptation, future studies can reveal how and why nurturing empirical sensitivity is a necessary prerequisite.

Secondly, and relatedly, optimal grip and exaptation suggests that accumulated empirical sensitivities and predispositions (the how, more than the what) result from a firm's collaborative efforts of striving towards ever higher standards of performance and form the basis of skilled adaptive action. What is at stake here is a collective sensitizing and co-responding to environmental affordances. If one accepts that DC derive from expert actions by skilled participants acting in situation-specific circumstances, future research needs to better understand the normative aspects of skilled adaptive action. These include shared judgements about what constitutes adequate/inadequate, appropriate/inappropriate, useful/not useful, better/worse, and so on. These judgements go beyond the articulated set of standards and include finer and finer differentiations that are collectively shared. Our aim is not to diminish the importance of cognitively-based research on DC. Rather, for us, what has not received sufficient attention is their essentially non-cognitive underpinnings. For example, verbal expressions such as "it doesn't feel right to me … does that feel right to you?" point to the unease felt; an unease that can only be alluded to but not accurately described. Similarly, seemingly innocuous non-verbal grimaces, shrugs, pursing of the lips, and other micro acts expressing discontent or deviation from normativity can affect eventual outcomes even though they are not regarded as significant in shaping eventualities. Difficult though it may be to

capture, future research can focus on such unreflective actions/reactions that often go unnoticed. An emphasis on skilled adaptive action can help to generate deeper insights into these lesser-known and lesser-understood aspects of human behavior, capabilities and potentialities.

Our non-cognitive framework also has important methodological implications for strategy researchers. Given our ecologically-framed and phenomenologically inspired theorizing, we suggest that strategy scholars draw on first-person methods to research skilled adaptive action. In particular, we highlight three methods that future research could employ to address non-cognitive aspects of collective adaptive actions. Firstly, we suggest that scholars employ "phenomenological interview" to understand experiences (Hoffding & Martiny, 2015; Petitmengin, 2006; Varela & Shear, 1999; Vermersch, 2009). Unlike interviews in general, the focus and scope of a phenomenological interview is "evoking" (Vermersch, 2009: 42) lived experiences. Practically, this means asking questions that circle around experiences to evoke pre-reflective dimensions of experiences, rather than trying to establish facts and content of experiences. Hence, the aim of the phenomenological interview is ask open ended "how" questions that aims at fine-grained descriptions of doings, rather than explanations or judgements about what was done.

Secondly, we suggest scholars can build on video methods to understand embodied action (Gylfe, Franck, Lebaron, & Mantere, 2016). The use of video recordings can provide novel techniques for researching "embodied orientation and attention-directing behavior … unfolding movement as participants point, touch, and manipulate the material environment in ways that are recognizable and meaningful … [and] … comparison of several episodes of interaction" (Gylfe et al., 2016: 136). By focusing on the body as a "bridge" in strategy making, video methods have the potential to reveal non-cognitive microfoundations that are transmitted between participants without cognitive representations.

Finally, we encourage scholars to follow exemplary longitudinal and qualitative studies that have the potential to unveil microfoundations (D'Adderio, 2014; Danneels, 2002; Salvato, 2009). Scholars have productively used ethnographic methods and observations to illuminate the activities and practices that unfold. To explicate the non-cognitive microfoundations, we suggest scholars can draw on "sensory ethnography" (Grasseni, 2009; Pink, 2015) which aims to challenge the cognitive bias in methodologies and recognize that experiences are multi-sensory. Methodologically, the aim is to "learn with" rather than "learn about" the experiences being researched (Ingold, 2011). The distinction between "with" and "about" is important because "with" implicates the researcher and the researched, whereas "about" merely describes someone else's experiences. For example, in conducting a phenomenological interview, the aim is not to record the interviewee's first-person account, but through engagement, co-produce an account that establishes the phenomenological insights. Similarly, in using video methods, we suggest the potential is greater to unveil the collective capacity to "educate attention" when the research is conducted with the participants rather than about them.

Boundary Conditions for a Non-Cognitive Framework

Our extended microfoundations of DC framework which emphasizes the non-cognitive substrate provides a way to establish boundary conditions of when and where DC theory applies. As Whetten (1989: 492) stated, "temporal and contextual factors set the boundaries of generalizability, and as such constitute the range of the theory." Attempting to establish boundary conditions for current DC framework is important, not least because it addresses a key difference between the two seminal articles previously discussed. For TPS, DCs are relevant to fast-changing environments while for EM, high-velocity environments are a boundary condition for the resource-based view.

Our extended non-cognitive microfoundational framework points to the importance of expertise as a boundary condition for skilled adaptive action. It is expert action involving

situation-specific skilled adaptive activities that differentiates our framework. While for beginner and novice actors, it is very important to have the analytical and detached systems, and deliberate rules of thumb to aid practice and to attain competency, genuine expertise cannot be attained until all these props (just like training wheels on a bicycle) are discarded (Dreyfus, 2005: 7). Similarly, once firms become experts at empirically sensing environmental affordances and have developed and refined their habitus they are able to display their DC dispositionally rather than in terms of rules, routines and heuristics.

CONCLUSIONS

All theoretical explanations of observed phenomena depend upon an established paradigm of comprehension; it inevitably guides our observational discrimination and orients us towards a preferred mode of conceptualization and theorizing. Thus, "Observational discrimination is not dictated by the impartial facts. It selects and discards, and what it retains is rearranged in a subjective order of prominence" (Whitehead, 1933: 183). Each paradigm of comprehension predisposes us to think and theorize in particular preferred ways to the exclusion of others. But since we cannot think without abstractions, "it is of the utmost importance to be vigilant in critically revising (our) *mode* of abstraction" (Whitehead, 1948: 59). This is what academic scholarship demands of us and this is how progress in understanding is achieved.

Reading through the extant literature on DC one is struck by the fact that there is an overriding commitment to a cognitivist view of human behavior. Thus, whether DC are construed as analytical and abstract (detached action), or as sensing, seizing and transforming or simple rules and rational heuristics (deliberate adaptive action), the underlying assumption remains that these involve mental content and symbolic representations and that their prior acquirement is essential for actors to behave intelligently and effectively.

Yet, as we show, there are equally valid alternative ways of explaining human adaptive behavior and effective responsiveness without recourse to a cognitivist, information processing

theory of the mind. Whilst cognitive explanations of DC play a useful role, our focus in this paper has been to show that they are ultimately underpinned by a non-cognitive substrate of micro skills involving empirical sensitivity and an associated habitus. Such a non-cognitivist understanding of intelligent action derives from an ecological understanding of the firm/environment nexus and a practice-based approach to skilled adaptive action. It extends our understanding of the idiosyncratic nature of DC and shows how such non-cognitive microfoundational skills can be the source of sustainable competitive advantage.

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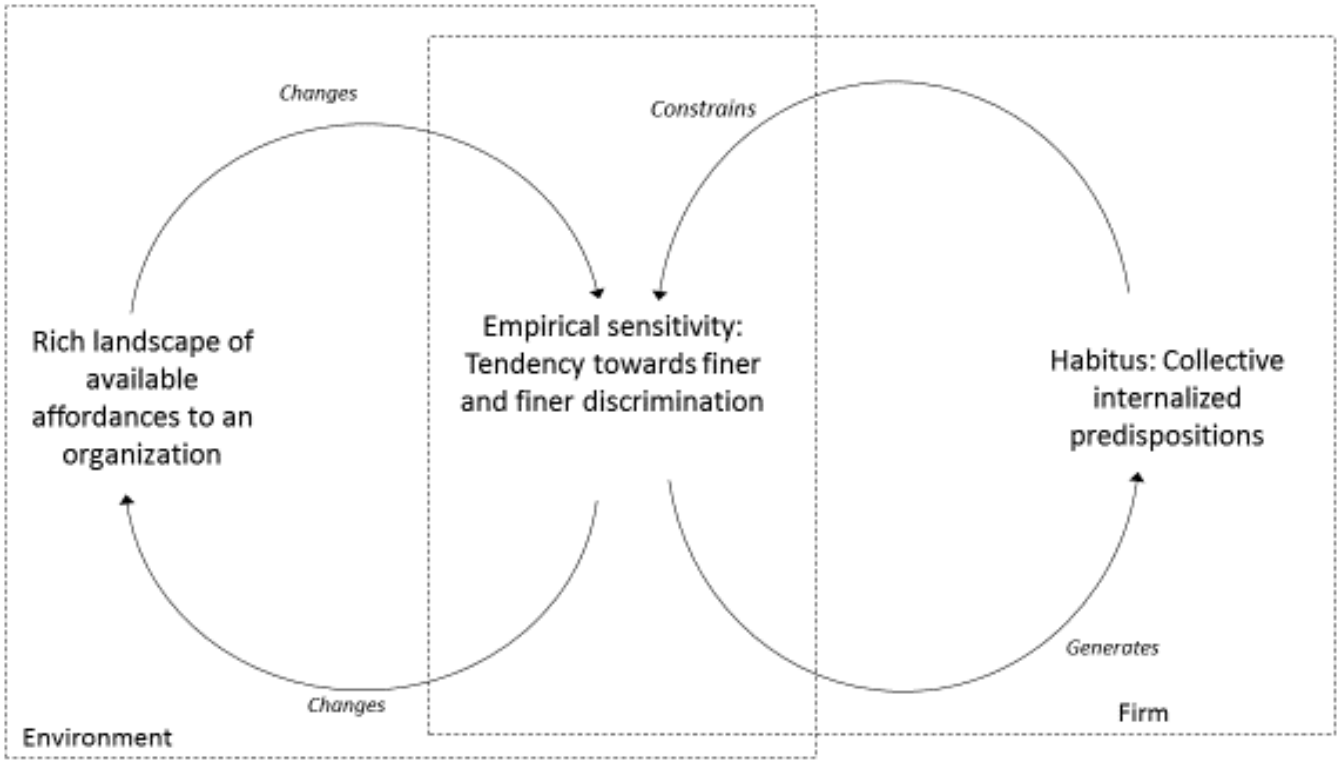
TABLE 1
Three Challenges Facing Dynamic Capabilities Research

Key Challenge	Teece and colleagues	Eisenhardt and colleagues	Unanswered Question	New theoretical concepts
Idiosyncrasies	Drawing on RBV, Teece et al. assume that firm-level heterogeneity exists. For example, they state, "competitive advantage … rests on the firm's idiosyncratic and difficult-to-imitate resources" (Teece et al., 1997: 513). But, they recognize the importance of context in the origin and significance of idiosyncrasies. Teece et al. note, "too often, the contextual dependence of original performance is poorly appreciated" (Teece et al., 1997: 525).	Drawing on RBV assumes that firm-level heterogeneity exists. For example, they state, "resources are heterogeneously distributed across firms, and that resource differences persist over time" (Eisenhardt & Martin, 2000: 1105) But they recognize the importance of situation in the origin and significance of idiosyncrasies. Eisenhardt and Martin emphasize, "dynamic capabilities strikingly involve the creation of new, *situation-specific* knowledge" (Eisenhardt & Martin, 2000: 1112, emphasis added).	How does the individual-contextual interact in generating idiosyncrasies?	**Affordances** explains how the individual-contextual interact to generate situation-specific knowledge. Affordances are relative and every surviving and thriving community occupies a certain *niche* in its environment.
Tacitness	Deliberate action by manager/entrepreneur. "The manager/entrepreneur must articulate goals, help evaluate opportunities, set culture, build trust, and play a critical role in the key strategic decisions" (Augier & Teece, 2009: 417). But, they recognize that dynamic capabilities are "several parts routine but at least one part 'something else' … The something else is non-routine strategizing and entrepreneurial activity, some of which might appear rather ad hoc" (Teece, 2012: 1399).	Dynamic capabilities are "fragile" and "unstable" (Eisenhardt & Martin, 2000: 1117) in rapidly changing environments. Because these routines are fragile and unstable, they argue that they are better conceptualized as "simple, experiential rules" or "rational heuristics" (Bingham and Eisenhardt, 2011; Eisenhardt and Martin, 2000). But, they recognize the role of "expertise in capability creation" (Bingham & Eisenhardt, 2011: 1459) and how individuals "*hone* their heuristics" (Bingham & Eisenhardt, 2011: 1459, emphasis added).	How do individuals and groups sense constant change and quickly adapt to change without recourse to cognition, structure or any kind of rules?	The possibilities an environment affords depends on **empirical sensitivity**, a collectively-shared and finely honed observational capacity to discriminate among the situations.
Imitability	For Teece et al. (1997: 525), "competences and capabilities, and the routines upon which they rest, are normally rather difficult to replicate." In other words, "a well understood and replicable best practice is not likely to constitute a dynamic capability" (Teece, 2007: 1321).	For Eisenhardt and Martin, because dynamic capabilities are essentially "best practices" they "have greater equifinality, homogeneity, and substitutability across firms than traditional RBV thinking implies" (Eisenhardt & Martin, 2000) even if they are "idiosyncratic in their detail and path-dependent in their emergence."	How can iterative, situation-specific and ongoing adaptations evolve and cohere over time to generate a semblance of consistency in collective actions and yet remain inimitable?	**Habitus** provides a consistency in collective actions. It explains the non-deliberate coordination and orchestration of productive actions within a collective without the need for explicit structures, systems, rules and procedures.

FIGURE 1

Non-Cognitive Framework: Affordances, Empirical Sensitivity and Habitus



Adapted from (Bruineberg & Rietveld, 2014: 4)

FIGURE 2

Extended Framework: Microfoundations of Dynamic Capabilities

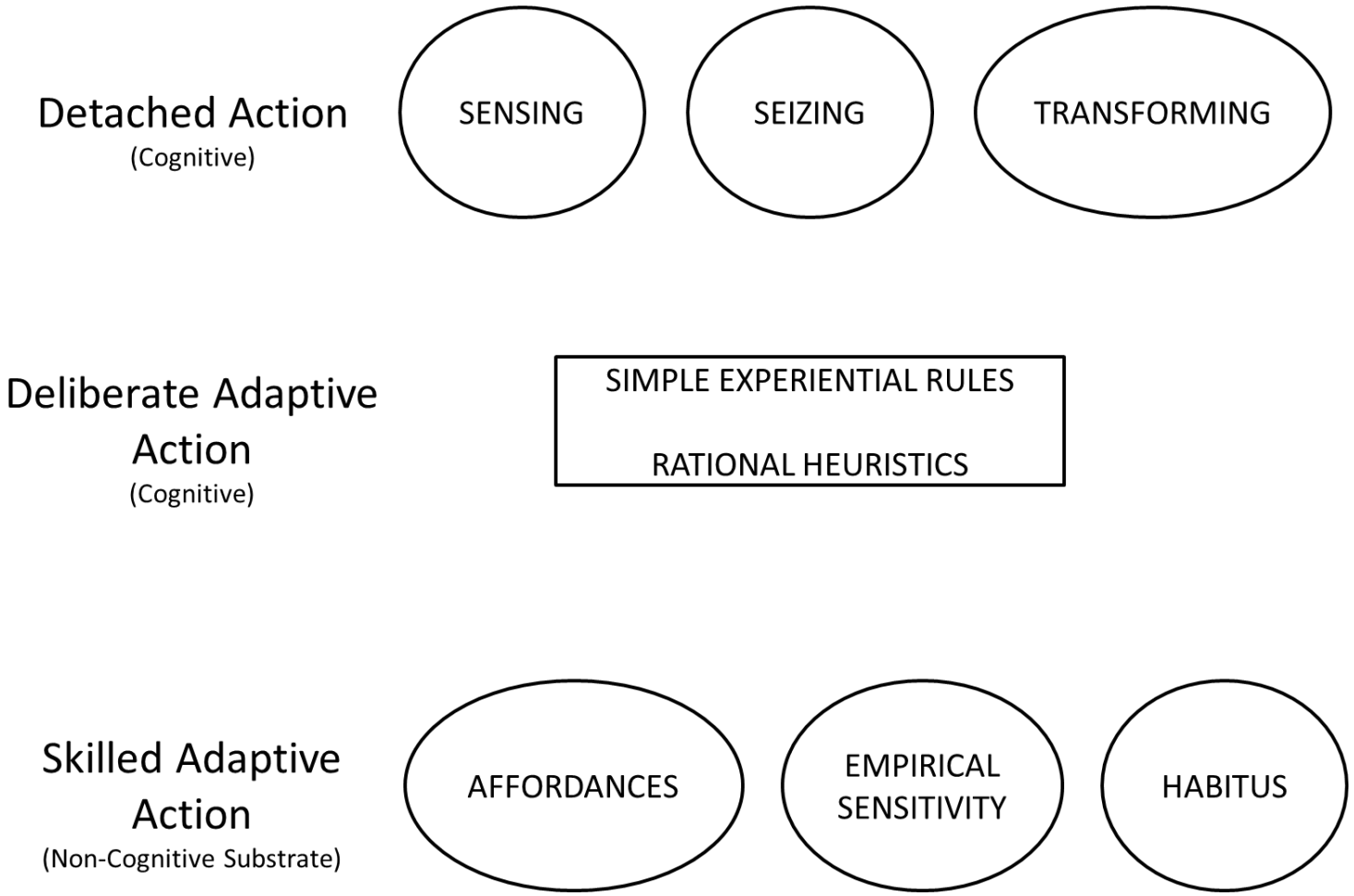


FIGURE 3

Skilled Adaptive Action: Mechanisms and Superior Outcomes